Importance of the Subject

Money serves four major functions- medium of exchange, store of value, unit of account and source of deferred payment. Demand for money is demand for real balances. The world of economic transaction has become broader with the use of money. Money is considered next to the two great inventions of the world, viz., the fire and the wheel. Money Demand elasticities have been considered of crucial importance for the operation and effectiveness of monetary policy. Demand for money has been subjected to empirical scrutiny in many countries because a stable demand for money function for money is a necessary condition for the viability of monetary policy.

Empirical research in this area has been around a few interesting issues and that includes empirical definition of money, choice of appropriate scale and opportunity cost variables, role of adjustment and expected lags, estimation of functional forms and temporal stability (Laidler, 1969).

According to Friedman (1956), demand for money function is the most stable Macroeconomic relation and also one of the most stable important components in the analysis of economic behaviour. In Macroeconomic analysis, the money demand function is a very important component, more precisely in selecting appropriate monetary implications. Stability aspect of money demand function is considered to be an important requirement for money targeting which can be used to estimate growth of money supply. A reliable and predictable linkage between monetary aggregates and changes in the arguments in the money demand function is crucial for the success of any policy which depends upon the control of monetary aggregates to affect economic activities.

Demand for Money- A Theoretical View

Classical Approach

According to Classical economists, money acts as a "numêraire". In other words, it is a commodity whose unit is used in order to express prices and values, but whose own value remains unaffected by this role (Sriram, 1999). However, money demand is neutral with no real economic consequences for its role as a store of value is limited under the classical assumption of perfect information and negligible transaction costs. The concept of money demand took formal shape through the quantity theory developed in the classical framework by two different but equivalent expressions.

The Quantity Theory of Money

Fisher (1911) provides the famous equation of exchange. The theory is based on the direct and proportionate relationship between the quantity of money and the price level. The equation of exchange $M_S V_T = P_T T$, which relates the quantity of money in circulation M_S to volume of transaction T and the price level of the article traded P_T in a given period through a proportionality factor V_T called the "transactions velocity of circulation." It is clarified that money is held simply to facilitate transactions and has no intrinsic value.

Neo-classical Approach

The alternative paradigm, the so called Cambridge Approach focused the demand for real money balances, as the important factor determining the equilibrium between price level with a given quantity of money. Whether money influences macro economic variables like the level and growth of GDP, employment and the rate of inflation is an important issue required in depth analysis, which may throw light on the question whether the 'Central Bank' has any power to regulate the economy.

Through links between money and the rate of interest which in turn is a determinant of both consumption and investment, money occupies an important place in Macroeconomics. Some economists consider money as 'neutral' while others believe that it is not. As a result, economists differ in their views on the role of monetary policy.

The Neo-classical economists emphasized both the functions of money- store of value and medium of exchange.

Keynesian Theory

Keynes (1930, 1936) built upon the Cambridge approach to provide a more rigorous analysis of money demand, focusing on the motive of holding money. In fact, it was Keynes who discovered the importance of the interest rate variable affecting to money demand. Three well known motives: transaction, precautionary, and speculative are the determinants of demand for money. Both the transaction and precautionary demand for money are mainly related to the income of the people and money serves as a medium of exchange. The speculative demand for money, a "Liquidity Preference" called by Keynes depends upon the future level of the interest rate. The aggregate speculative demand for money function is smooth and negative function of the current level of the interest rate. According to Keynes, major implication of demand for money function is that at low level of interest rate, money demand becomes perfectly elastic to

interest rate and such situation is called as “liquidity trap” where every increase in money supply is kept as liquidity by the people.

Post Keynesian Money Demand Theories

Following Keynes, a number of models were developed to confirm the relationship between the demand for real money and income and interest rate. These models can be classified into three separate frameworks, namely transactions, asset and consumer demand theories of money. Medium of exchange function leads to inventory models and the precautionary demand models treated net inflows as uncertain. The store of value function has given the portfolio model where money is held as a part of portfolio assets of the individuals.

Baumol and Tobin have evolved an inventory approach in which money is demanded as inventory for transaction purpose. Financial assets which offer higher yields than money, the transaction cost of foregoing between money and these assets are justified by holding of such inventory.

Alternatives to the transaction demand approaches of Baumol and Tobin can be found in Barro and Fischer (1976),Cuthbertson and Barlow (1991), Roley (1985) had listed the theoretical work done by Clower and Howitt (1978).

“Cash-in–advance models” are another version which too emphasizes on transaction role of money. “Cash in advance constraint” or “Clower constraint” which puts restriction that the purchases in a given period should be paid for, by currency brought in the form of the previous period. In developing the cash-in–advance models contributed by Lucas (1980) provides micro foundations for money and supported transaction demand for money.

Another approach, stresses precautionary demand for money. As there is uncertainty regarding payments to be made by people, they do hold money for precautionary motive. While holding of money incurs cost of illiquidity that is interest foregone on it. Dornbuch and Fischer (1990) suggested that the person must optimize the amount of precautionary cash balances against the disadvantage of foregoing the interest on illiquidate.

Akerlof and Milbourne (1980b), Milbourne, Bulckholtz and Wason (1983) have presented some models on precautionary demand for money.

Money as an Asset Approach

The asset function of money led to the asset of portfolio approach where major emphasis is placed on risk and expected returns of assets. The “Yale School” propounded the theories of

demand for money in the context of a portfolio choice problem which considered money demand as the demand for assets and emphasized on the store of value function of money. Models interpreted money more broadly as problem of allocating wealth among portfolio assets which can earn explicit income and implicit service flows. Models are developed to determine the relationship between the interest rate and the demand for real money considering wealth and liquidity as other key variables determinants of demand for money.

Money as Consumer Demand Approach

Alternatively to the all above theories, the consumer demand theory approach (see Friedman, 1956 and Barnett, 1980) considers the demand for money as a direct extension of the traditional theory of demand for any durable good (see Feige and Pearce, 1977), in the "Re-statement of The Quantity Theory of Money" Friedman (1956) argued that demand for assets should be based on consumer choice. He further treated money as an asset yielding, a flow of services and utilized a broad wealth concept considering human wealth and non-wealth as the budget constraint. Friedman analysed the broad money along with the views of the Neo-Keynesians' portfolio theory of money demand considering money as an asset and added real goods which can yield a stream of services. He further suggested to include expected rate of inflation and concluded wealth as a key determinant of money demand.

The theories of consumer demand have been playing a leading role in recent literature in the area of monetary aggregation theory [see Barnett (1980)]. Equal weights are calculated for all monetary aggregates. This procedure implicitly assumes that the different segments of the non - bank public treat each component of the monetary aggregates they hold as perfect substitutes.

By applying Microeconomic principles, the weights of monetary aggregates which are calculated based on the moneyness or substitutability of assets where assets are considered as inputs in the production function of money services contributed to the output of money services. The greater the contribution the larger the weight the particular asset gets. Anderson, Jones, and Nesmith (1999b) showed various new formulations and aggregation techniques used to work out the monetary aggregates. The aggregates are statistical numbers generated based on the theory of index numbers. One of the common aggregate employed in the recent empirical literature is "Divisia Index" [Fase and Winder (1994) state that F. Divisia first formulated the monetary index concept, in a series of articles published in Revue d' Econimie Politique].

After analyzing all these models for money demand, it is interesting to point out that the though they are analysed from different angles, the resulting implications are almost the same for all. In all analyses the optimal stock of real money balances is inversely related to the rate of return on earning assets. It means that the interest rate is positively related to real income. The general differences are observed with respect to the transaction (scale) variable and opportunity cost of holding money.

Keeping in view various Money Demand Theories, the following objectives are set for the present study.

Objectives of Study

1. To analyse critically the present theories and advance econometric techniques of demand for money in India.
2. To study the established framework for the Indian Economy in which demand for money theories can be analysed.
3. To set up and estimate various econometric models for demand for money based on the critical review of the existing literature.
4. To identify and measure the effects of the significant variables affecting money demand in India.
5. To check stability aspect of demand for money in India by dividing the entire period of study into various sub periods.

Literature Review

Voluminous literature is now available for analyzing money demand functions. Previous works were mainly confined to industrialized countries, specifically U.S.A. and U.K. Later on, the economists of several industrial and developing countries have developed interest in this area. Almost all the Central banks have realized that for the stronger monetary base and monetary policy, stable money demand function is essential. During the last ten years or so advancement made in time series analysis of money demand models are mostly based on empirical models built previously.

Most of the money demand theories emphasize one of the theories like transaction, precautionary, or utilitarian considerations. However, a common feature of almost all the theories is that they share common important elements (variables) among them. Commonly they have analysed a relationship between the quantity of money demanded and a set of few

important economic variables linking money to the real sector of the economy [Judd and Scadding (1982), p.993]. Though all the theories consider similar variables to analyse money demand, they differ in the specific role assigned to each.

Commonly work begins with the simple formulation of money demand theory in the form of $M = f(Y, r)$, where real money demand (M) is related to the scale variable (Y) and the opportunity cost variable (r) as suggested by different theories. The choice variables are suggested by different theories. A list of theories comprising the development that has taken place in the money demand theory over the past three decades can be as: Goldfeld (1973), Gorden (1984b), Roley (1985), and Goldfeld and Sichel (1990). These theories have been written almost in steady intervals; provide an understanding of the type of empirical work carried out in a number of countries to reflect the changing financial and economic conditions.

Various studies have provided a different choice of variables like scale variable and opportunity cost variable which vary from study to study considering specific theories. The transaction theory laid more emphasize on the medium of exchange function of money and while asset theory analysed the problem of allocating wealth among the portfolio of assets which included money.

These two sets of theories on theoretical ground suggested differences regarding the following three variables [see Judd and Scadding (1982)]: regarding money definition, as transaction theories considered only narrow money which includes actual means of payment. On the other hand asset theories emphasized on the broader money definition considering liquid substitutes like saving deposits. For scale variable, transaction theories included income while asset theories employed wealth. For the opportunity cost of holding money, transaction theories suggested short-term interest rates such as yields on Treasury bills (T-bills), while on the other hand asset theories proposed yields on long-term financial assets.

The various earlier studies on money demand can be classified on the basis of the inclusion of scale variables like income and consumption. On the other hand opportunity cost variables like interest rate and inflation have been found in these studies. Majority studies are also categorized so far as the use of appropriate empirical tests based on simple linear , log-linear, bi-variate co-integration and multi-variate co-integration models and their conclusions differed in their respective analysis [Fase (1993), Sriram (2001), Knell and Stix (2003, 2006)].

Across the countries, the definition of money stock varies due to either institutional characteristics or arbitrary decisions [Boughton (1992)]. Laidler (1993) has suggested utilizing the correct definition of money and therefore, it becomes an empirical matter.

Apart from the money stock definition, there are also empirical studies estimating the demand for the individual components of money. Desegregation of money can be done in two ways: 1) by the type of assets, and 2) by the holders. More recently, studies have also been found using divisia aggregates [see Jassen (1996), and Anderson, Jones and Nesmith (1997b)].

The scale variable is utilized as a measure of transaction relating to economic activity. Laidler (1997) has concluded that the wealth is the most important explanatory variable in his critical review of literature on money demand theory. Johannes and Nasseh (1985) found that income is a preferred measure of long-run money demand for the U.S.A. using annual data and quarterly data. Thornton (1985) has also studied money demand equation by using 'current income' and it performed better in short-run money demand. Studies by Anuar (1986), Ghaffar and Habbibullah (1987), Tan (1997) and Semudram (1981) have used similar scale variable of current income.

In Indian case, M.S.Trivedi (1980, 1984, 1992) had considered both the expected and permanent income as scale variables in his various studies and found satisfactory results for orthodox quantity theory of money demand.

Recent research focused on the other scale variables involving more comprehensive measures of transaction and segregation of transactions into various components, with the idea that all transactions are not equally "money intensive" [see Goldfed and Sichel (1990)].

In the recent study by Dahalan et al (2007), the identification of appropriate scale variable in Malaysian money demand was conducted by using various alternative scale variables such as income, consumption, disposable income and domestic absorption. They found that the income scale variable seemed to be better in case of M_2 than M_1.

The other issue in the form of money demand function is to select an appropriate opportunity cost variable. The opportunity cost of holding money involves two aspects: 1) the own rate of return on money and 2) the rate of return on alternative assets. Tobin (1958) and Klein (1974) are in favour of including both of the rates. Omission of own rate of return of money often leads to break down in the estimated demand function especially when the financial innovation occurs in the economy [see Ericsson (1998)]. Many researchers for the return on

assets alternative to money had utilized short-term rates like yields on Government securities, call money rates, commercial paper or saving deposits, as they are close substitute of money. However, Laidler (1993) has suggested that, some sort of variable should be included rather than "which" variable to be included for the opportunity cost of holding money, as research has shown that money demand is not sensitive to a particular measure of variable chosen.

The return on real assets is usually represented by the expected rate of inflation [Sriram, (1999)]. Theoretically Friedman (1956, 1969) pioneered the inclusion of the expected inflation. For the developing countries where the financial sector is underdeveloped, the expected rate of inflation is the only variable used as the opportunity cost of holding money.

Due to market imperfection and the absence of money market in the rural areas of India, Balbir Singh (1970) had found that the rate of interest is not important in determination of the demand for money function in Indian Economy. However, Ramlal Sharma (1978), Shastri (1962), Gupta (1969) have concluded in the case of India that the demand for money is interest elastic. Contrary to above analysis Sampath and Hussain (1981) and Deadman and Ghatak (1981), have concluded that demand for money is interest inelastic.

Pure economic theory does not provide any rationale as to correct mathematical form of the money demand function. Generally three major functional forms dominated in the empirical literature: 1) Linear additive, 2) Log-linear, 3) Linear-non additive [see Feige and Pearce (19997)]. However, the Log-linear version is the most appropriate functional form, according to most of the studies.

Demand for money function in India has been extensively studied with various specification and estimation issues. M.S.Trivedi (1980, 1983, 1984) has studied money demand function in India by applying partial adjustment models. R.K. Sampath and Zakir Hussain have analysed various conventional models for the period of 1960 to 1975 by using Log-linear functional forms of the models.

Moosa (1992) was the first to study the stationarity and the cointegration relationship among the variables of the money demand function in India. He has utilized three types of money supply- cash balances, M_1 and M_2 to analyse cointegration tests on real money balances, short-term interest rates and industrial production for the first quarter of 1972 to the last quarter of 1990. He found the cointegration relationship among all the money supply aggregates with

output and interest rates. Moosa (1992) suggested on the basis of his study that narrow definition of money supply is better for pursuing monetary policy.

Another study of Bhattacharya (1995) used three aggregates of money supply- M_1, M_2 and M_3 for the annual period of 1950 to 1980 along with real GNP, long term and short-term interest rates and performed cointegration tests. He found a cointegrating relationship among the variables only when M_1 is utilized and concluded that the long-term interest rates are more sensitive to money demand. He has also estimated an error correction model (ECM) and summarized that the error correction term was significant and negative when M_1 was used and held that monetary policy is stable over the long term when money supply is narrowly defined.

Bahmani-Oskooee and Rehman (2005) have analysed money demand function beginning with first quarter of 1972 to fourth quarter of 2000 for India and other six Asian countries. They used Auto Regressive Distributed Log Approach (ARDL) described in Pesareen et al. (2001), and performed cointegration tests on real money aggregates, industrial production, inflation rates, and exchange rates in terms of U.S. dollar. Cointegrating relationships were detected when money supply was defined as M_1 and suggested to target M_1 for setting monetary policy.

Some contrasting results can also be found in prior research that uses money supply defined broadly which consider money demand function is stable. Such research like, Pradhan and Subramanian (1997) using annual data for 1960 to 1994 for India, employed cointegration and error correction model to detect relationship among real money balances, real GDP and nominal interest rates. They found error correction term significant and negative for M_1 and M_3 money supply. So they were in opinion of that the money demand function is stable for the both M_1 and M_3 variables. While on the other hand Das and Mandal (2000) detected only M_3 money supply when employed in India's money demand function. They have analysed monthly data for the period of April 1981 to March 1998 and performed cointegration tests and found cointegrating vectors among the money balances, industrial production, short-term interest rates, wholesale prices, share prices and real effective exchange rates. They had concluded that M_3 is relevant variable in long-term and was found stable.

Ramachandran (2004) has also considered that in the long-term, an increase in M_3 as a latent indicator of future price movements in India. Moreover, studies of Nag and Upadhyay (1993), Parikh (1994), Rao and Shalabh (1995), Rao and Singh (2006), and others have performed quantitative analyses of India's money demand function. They have tended to

conclude that India's money demand function is more stable when money supply is defined narrowly, therefore Reserve Bank of India should have to adopt cash or M_1 when determining monetary policy.

Takeshi Inoue and Shigeyuki Hamori (2008) have analysed India's money demand function during the period of 1980 to 2007 using monthly data and annual data for the period of 1970 to 2007 and performed cointegration test. They used M_1 and M_2 money supply and detected cointegrating vector among real money balances, interest rates and output. Contrasting results were found when they apply M_3 there is no long-run equilibrium relationship in the money demand function. Moreover, when the money demand function was estimated the sign conditions of the coefficients of output and interest rates were found to be consistent with theoretical rationale, and statistical significance was also confirmed when the money supply was represented by either M_1 or M_2.

As is the case with the prior studies referred above that India's money demand function is stable.[1] Moreover, prior studies performed using multiple money supply aggregates have concluded that India's money demand function is more stable when money supply is defined narrowly, and therefore the Central bank should concentrate on cash or M_1 when determining monetary policy. Contrasting with that position, other studies have concluded that the money demand function is stable when money supply is defined broadly. Views therefore differ regarding which money supply definition should be utilized while framing monetary policy.

Data, Method and Model Specification

The Error Correction Model (ECM) proved to be a successful tool in applied money demand research [Sriram, (1999)]. It is a dynamic-error-correction model where the long-run equilibrium is embedded in an equation that captures the short-run variation and dynamics [see Kole and Meade, (1995)]. Granger (1986) had shown that the concept of stable long-term equilibrium is the statistical equivalence of Cointegration and implies the presence of dynamic error-correction term.

So far as the estimation techniques are concerned, there are two widely used approaches. They are developed by Engle and Granger and Johansen (1988) and Johnsen and Jusdius (1990) respectively. The later approach is more prominent as it provides an opportunity to analyse the

[1] Upadhyay and Nag (1993), Parikh (1994), Rao and Shalabh (1995), Rao and Singh (2006), and others as well have alos performed quantitative analyses of India's money demand function.

presence of multiple cointegrating vector and has shown that it is more efficient than the earlier version of it [Sriram, (1999)].

In the present study all Monthly, Quarterly and Annual data considering two types of Money- M_1, M_3 are used and estimated India's money demand function. In contrast to the prior studies, this study proposed to utilize cointegration test on money supply for all specified time series of monetary aggregates along with output, income and interest rates as money demand function variables. The present study applied dynamic ordinary least-square method and focused on the characteristics of India's money demand function through examinations of appropriate sign conditions and statistical significance of the variables and coefficient of variables.

The study comprises of Monthly data over the period of January 1980 to December 2008. The data source for the Industrial Production Index (IIP) and the Wholesale Price Index (WPI) as well as for Consumer Price Index (CPI) is from Economic Survey 2008-09 as well the latest published Economic Survey of India. While the money supply aggregates are collected from various issues of the RBI Bulletin and deflated by both the WPI and CPI. Apart from it, the call money rate is taken as the interest rate and considered from RBI Bulletin.

For the Quarterly data the period of first quarter 1970 to Fourth quarter of 2008 are taken. Again IIP, WPI, CPI and Call money rates are considered as scale and opportunity variables in the quarterly analysis. For the annual data, we used data over a period of 1970 to 2008. Real NNP, WPI and GDP deflator are experimented. The short-term and Medium/Long-term interests are taken as opportunity cost variables in money demand function. Monetary aggregates like M_1, and M_3 are deflated by GDP deflator as well as by WPI. Logarithm values are used for money supply, price levels, output and income. Interest rates are experimented with and without logarithms.

As a primary analysis, we have carried out the augmented Dickey-Fuller tests for the logs of real money balances, output, income, and interest rates (Dickey and Fuller 1979). We have tested each variable and found to have unit-roots, whereas the first differences of each variable found without a unit-root. Thus, it can be summarized that each variable is a nonstationary variable with a unit root.

Chapter Scheme

Demand for Money in India –An Econometric Analysis is having following structure as chapter schemes.

1. Introduction
2. Importance of the subject
3. Theoretical Aspects of the Study
4. Review of Literature
5. Econometric Analysis of Data
6. Conclusions and policy implications

Tentative Conclusions:

From the alternative OLS money demand functions, it is tentatively found that the income elasticity ranges from 0.70 to 1.50 for M_1 while it ranges from 1.4 to 2.6 for M_3. These results confirm that in a developing economy like India, transaction demand for money is more important.

The elasticity is more than unity in all most of all the cases indicating that there are no economies of scale in holding money and a proportionate change in income requires more than a proportionate change in money to sustain it.

Income elasticities of demand for money are found to be significantly greater than one and in nearly two, supporting the monetarists' hypothesis that money holding is a luxury in India.

The results show the interest rate variables are statistical insignificance as a proxy for opportunity cost variable for monetary management in India. This may be attributed to the less developed money market, lack of representative interest rate or inability to model useful interest rates.

Cointegration tests are employed to check the presence of long run equilibrium relationship underlying the money demand function. From the test results it is confirmed that all the variables examined are found to be differenced stationary. The findings from Engle-Granger two step procedure reveals that an equilibrium long run relationship does exist for both the aggregates (M_1 and M_3) with suitable determinants for the total sample period. These findings thus support the use of either of the monetary aggregates as the use of either of the monetary aggregates as the guide for monetary targeting.

Limitations of the Study

Any Econometric study will have many limitations, even when the models are rigorously specified. This study, like any other Econometric study may suffer from the following limitations.

1. In addition to the independent variables included in the study, there may be some other important independent variables that are excluded. And to that extent, the results will derive may not be perfect.
2. The propose models will be compared solely on the basis of the statistical criteria of their explanatory power. However, some models may have higher explanatory power but may not have sound theoretical underpinning.
3. It is needless to say that the importance and usefulness of the study depend upon the quality of data on which the study is based. To the extent that the data are inaccurate or there are definitional or measurement shifts during this period, the conclusions derive may not be entirely valid.
4. The results obtained here are true only time and space considered that is for India and the time period utilize. The results cannot be generalised for any other geographical and time periods.

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